REMARKS:

Final Office Action

In the Office Action, claims 1, 5, 6, 12, 13 and 17, 18-22 and 25 were rejected under 35 U.S.C. 102(e) as being anticipated by Wallach et al, and claims 11, 23 and 24 were rejected under 35 U.S.C. 103(a) as being unpatentable over Wallach et al. In view of Ezaki.

Ezaki (U.S. Patent No. 6,594,485)

Ezaki was filed in the U.S. on October 14, 1999. The priority of the present invention goes back to November 12, 1998. Therefore, Ezaki is not prior art against the present application. To exclude Ezaki, Applicants are herewith submitting a certified translation of the Japanese priority document.

Present Amendment

Since Ezaki is no longer prior art, claims 11, 23 and 24 should now be allowable. In the above amendment:

(1) Applicants have combined claim 6 with claim 11. Accordingly, claim 6 as combined with claim 11 should be allowable. No new limitation has been added to claim 6. Nor has any existing limitation been removed from either claim 6 or claim 11. Therefore, the amendment to claim 6 should not raise any new search issue. Since claim 6 as combined with claim 11 should be allowable, claims 10 and 12, which depend on claim 6, should also be allowable.

(2) Applicants have cancelled claims 1, 5, 11, 13 and 17.

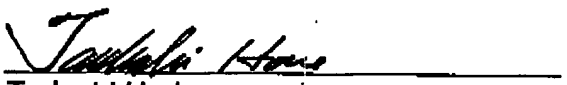
(3) Applicants combined claim 18 with claim 23. Accordingly, claim 18 as combined with claim 23 should be allowable. No new limitation has been added to claim 18. Nor has any existing limitation been removed from either claim 18 or claim 23. Therefore, the amendment to claim 18 should not raise any new search issue. Since claim 18 as combined with claim 23 should be allowable, claims 19-22 and 24-25, which depend directly or indirectly on claim 18, should also be allowable.

(4) Applicants have cancelled claim 23.

The certified translation submitted herewith has overcome Ezaki. Therefore, claim 11, 23 and 24, which Ezaki was relied upon to reject, should now be allowable.

Claim 6 has been combined with claim 11 and thus should now be allowable. Claim 18 has been combined with claim 23 and thus should now be allowable. Also, the Examiner has already examined claims 6, 11, 18 and 23. Therefore, there should be no new search issue raised by the present amendment.

Respectfully submitted,



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Case No.: 9683/63

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Michiyasu CHIKADA
Tetsuya TANIGUCHI

Serial No.: 09/581,632

Filing Date: June 13, 2000

For: COMMUNICATION CONTROL METHOD, COMMUNICATION CONTROL APPARATUS AND STORAGE MEDIUM

Examiner: DINH, Khanh Q.

Group Art Unit No.: 2155

SUBMISSION OF CERTIFIED ENGLISH TRANSLATION

Commissioner for Patents
P.O. Box 1450
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Dear Sir:

Applicants submit herewith a certified translation of Japanese Patent Application No. 10-322605.

Respectfully submitted,

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VERIFICATION OF TRANSLATION

I, the below named translator, hereby declare that:

My post office address is as stated below, and

I am knowledgeable in the English language and in the language in which the below-identified Japanese patent application was filed, and that I believe the English translation of Japanese patent application No. 10-322605 is a true and complete translation of the above-identified Japanese patent application as filed.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Date: this 12th day of July, 2004

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JP10-322605

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[Reference Number]	DCMH100082
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[International Patent Classification]	H04M 11/00
[Title of Invention]	Communication Control Method, Communication Control Apparatus and Storage Medium
[Number of Claims]	10
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[Deposit Number]	038265	
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[Item]	Specification	1
[Item]	Drawing	1
[Item]	Abstract	1
[Necessity of Proof]	Necessary	

[Document Name] Specification

[Title of Invention] Communication Control Method, Communication Control Apparatus and Storage Medium

[Claims]

[Claim 1] A communication control method comprising the steps of:

receiving data transmitted via a communication line;

detecting an interruption in communication;

obtaining information on a line status at a time of the interruption when the interruption occurs before a completion of receiving all data; and

reestablishing communication when it is determined on the basis of the obtained information that the line status is good.

[Claim 2] A communication control method according to claim 1, further comprising a step of, when the interruption occurs before a completion of receiving all data, performing a control not to prevent a fact of the interruption in communication from being notified to a destination of the data.

[Claim 3] A communication control method according to Claim 1 or 2, further comprising the steps of:

obtaining a cause for the interruption in communication; and

notifying a fact of the interruption in communication to a destination of the data when it is determined on the basis of the obtained cause that reestablishment of communication is impossible.

[Claim 4] A communication control method comprising the steps of:

receiving data to be transmitted;

starting to transmit the data via a communication line;

detecting an interruption in communication;

obtaining information on a line status at a time of the interruption

when the interruption occurs before a completion of receiving all data; and

reestablishing communication when it is determined on the basis of the obtained information that the line status is good.

[Claim 5] A communication control method according to Claim 4, further comprising a step of, when the interruption occurs before a completion of receiving all data, performing a control not to prevent a fact of the interruption in communication from being notified to a destination of the data.

[Claim 6] A communication control method according to Claim 4 or 5, further comprising the steps of:

obtaining a cause for the interruption in communication; and

notifying a fact of the interruption in communication to a destination of the data when it is determined on the basis of the obtained cause that reestablishment of communication is impossible.

[Claim 7] A communication control method comprising the steps of:

receiving data to be transmitted;

starting to transmit the data via a communication line;

obtaining information on a line status at a time of the transmission; and

establishing communication when it is determined on the basis of the obtained information that the line status is good.

[Claim 8] A communication control method according to any one of Claims 1 to 7, further comprising the steps of:

monitoring the line status when it is determined that the line status is not good; and

establishing communication when it is determined on the basis of the monitoring that the line status is good.

[Claim 9] A communication control apparatus for executing a

communication control method according to any one of Claims 1 to 8.

[Claim 10] A storage medium that stores a program for causing a computer to execute a communication control method according to any one of Claims 1 to 8.

[Detailed Description of the Invention]

[0001]

[Technical Field of the Invention]

The present invention relates to a communication control method for a communication system in which a plurality of communication terminals are connected with each other through a wired or wireless communication network, a communication apparatus and a storage medium, and specifically to a method for enabling communication terminals to effectively communicate with each other when establishing communication or when reestablishing communication after an interruption of communication.

[0002]

[Prior Art]

When communication terminals communicate with each other via a communication line and the communication is interrupted, the communication control apparatuses of the terminals terminate the communication and notify the communication modules of the terminals that the communication has been interrupted. The communication modules terminate operations for communication.

[0003]

For example, during downloading of desired data with a personal computer, if the communication is interrupted for an unexpected cause, the interruption is notified to the communication application, and a user has to close and restart the application to the download the data from its beginning. Also, during access to a homepage on the Internet using a

browser, if the communication is interrupted, the browser displays a message that tells the interruption, and a user has to close the browser. Consequently, the user is prevented from continuing access to the homepage.

[0004]

Also, when a communication terminal establishes communication with another communication terminal, when a communication terminal reestablishes communication with another communication terminal after an interruption in communication, the communication terminal performs operations for establishing communication with disregard to the line status.

For example, when a user accesses information via the Internet using a personal computer, the computer performs a series of operations for establishing communication even if the line status is not good. Also, when a user communicates data using a mobile phone or a PHS, the mobile phone or the PHS performs operations for establishing communication with disregard to the line status or a cause for an interruption in communication. Also, the mobile phone or the PHS, when reestablishing communication automatically after an interruption in communication, performs the operation after a predetermined time period which the timer counts.

[0005]

[Problems to be Solved by the Invention]

As stated above, if communication is interrupted and a use reestablishes communication, the user is required to start an authentication process and a data transfer from scratch. This problem brings about an unnecessary communication charge and an unnecessary service charge to be paid to an on-line service operator or an Internet provider.

Thus, in proportion to the volume of data to be transferred or the number of links followed by a user to access the target homepage, the burden on a user is increased.

Even when a line status is not good, operations of establishing or reestablishing communication is tried vainly, a cause of an interruption in communication is not utilized effectively when reestablishing communication.

[0006]

The present invention is made in view of the above-mentioned circumstances, and an object of the present invention is to provide a communication control method, a communication control apparatus and a storage medium which make it possible to reestablish communication smoothly when communication is interrupted, and to establish or reestablish communication without unnecessary delay even when using a communication terminal.

[0007]

[Means for Solving the Problems]

To achieve the object, a communication control method recited in Claim 1 comprises the steps of: receiving data transmitted via a communication line; detecting an interruption in communication; obtaining information on a line status at a time of the interruption when the interruption occurs before a completion of receiving all data; and reestablishing communication when it is determined on the basis of the obtained information that the line status is good.

[0008]

A communication control method recited in Claim 2 is a communication control method according to Claim 1, further comprising a step of, when the interruption occurs before a completion of receiving all data, performing a control not to prevent a fact of the interruption in communication from being notified to a destination of the data.

[0009]

A communication control method recited in Claim 3 is a

communication control method according to Claim 1 or 2, further comprising the steps of: obtaining a cause for the interruption in communication; and notifying a fact of the interruption in communication to a destination of the data when it is determined on the basis of the obtained cause that reestablishment of communication is impossible.

[0010]

A communication control method recited in Claim 4 comprises the steps of: receiving data to be transmitted; starting to transmit the data via a communication line; detecting an interruption in communication; obtaining information on a line status at a time of the interruption when the interruption occurs before a completion of receiving all data; and reestablishing communication when it is determined on the basis of the obtained information that the line status is good.

[0011]

A communication control method recited in Claim 5 is a communication control method according to Claim 4, further comprising a step of, when the interruption occurs before a completion of receiving all data, performing a control not to prevent a fact of the interruption in communication from being notified to a destination of the data.

[0012]

A communication control method recited in Claim 6 is a communication control method according to Claim 4 or 5, further comprising the steps of: obtaining a cause for the interruption in communication; and notifying a fact of the interruption in communication to a destination of the data when it is determined on the basis of the obtained cause that reestablishment of communication is impossible.

[0013]

A communication control method recited in Claim 7 comprises the steps of: receiving data to be transmitted; starting to transmit the data via a

communication line; obtaining information on a line status at a time of the transmission; and establishing communication when it is determined on the basis of the obtained information that the line status is good.

[0014]

A communication control method recited in Claim 8 is a communication control method according to any one of Claims 1 to 7, further comprising the steps of: monitoring the line status when it is determined that the line status is not good; and establishing communication when it is determined on the basis of the monitoring that the line status is good.

[0015]

A communication control apparatus recited in Claim 9 is a communication control apparatus for executing a communication control method according to any one of Claims 1 to 8. A storage medium recited in Claim 10 is a storage medium that stores a program for causing a computer to execute a communication control method according to any one of Claims 1 to 8.

[0016]

[Embodiments of the Invention]

The preferred embodiments of the present invention will hereinafter be discussed with reference to the attached drawings.

[0017]

1. The principle of operation of the embodiment

Fig. 1 shows a configuration of a communication system in which a communication control method according to the embodiment implemented.

Communication terminal 1A comprises communication control module 2A and communication module 3A. Communication terminal 1B comprises communication control module 2B and communication module 3B. Communication terminals 1A and 1B communicate with each other

via Data Circuit Transmitting Equipments (DCEs) 4A and 4B and communication line 5.

[0018]

1.1. The principle of operation for establishing communication

The principle of operation for establishing communication will be described with reference to the flowchart shown in Fig. 2.

Fig. 2 is a flowchart showing operations of application 6, communication control unit 2 of communication terminal 1, and DCE 4 provided between communication terminal 1 and communication line 5. Application 6 is a communication application program (described in Figs. 2 to 11 as "AP") loaded into a memory of communication terminal 1.

[0019]

When application 6 sends a connection request for establishing communication via communication line 5 (S1), communication control unit 2 sends a request for information on the current line status to DCE 4 (S2).

DCE 4, on receiving the request, checks the line status of communications line 5, and sends the check result to communication control unit 2 (S3). On the basis of the check result, communication control unit 2 determines whether the current line status is good (S4). When determining that the line status is good, communication control unit 2 sends to DCE 4 a request for establishing communication (S11).

[0020]

When determining that the line status is not good, communication control unit 2 sends to DCE 4 a request for monitoring line statuses (S5). DCE 4, on receiving the request, enters a monitoring mode for monitoring the line status (S6). During the monitoring mode, DCE 4 checks the line status at predetermined intervals.

Communication control unit 2, after sending the request, enters a standby mode (S7), and awaits a monitoring result from DCE 4 for a

predetermined standby period. When the standby period expires, communication control unit 2 notifies application 6 of a failure of establishing communication (S8 → S10).

[0021]

DCE 4, when determining that the line status is good within the standby period, notifies communication control unit 2 of this line status, and communication control unit 2 sends to DCE 4 a request for establishing communication (S9 → S11). When determining that the line status is not good, DCE 4 continues monitoring the line status (S9 → S6).

[0022]

1.2. The principle of operation for reestablishing communication

The principle of operation for reestablishing communication will be described with reference to the flowchart shown in Fig. 3.

When communication is interrupted due to some line disturbances, DCE 4 notifies communication control unit 2 of the interruption and a cause of the interruption (S20).

Communication control unit 2 determines on the basis of the notified interruption cause whether to reestablish communication automatically (S21). When the interruption cause is a message telling that communication cannot be reestablished, communication control unit 2 notifies application 6 of the interruption in communication (S22). When the interruption cause is a message telling that communication can be reestablished, communication control unit 2 sends to DCE 4 a request for information on the line status instead of notifying application 6 of the interruption in communication (S23).

[0023]

DCE 4, on receiving the request, checks the lines status and sends the check result to communication control unit 2 as a line status response (S24). Communication control unit 2 determines on the basis of the line

status response whether the current line status is good (S25). When determining that the line status is good, communication control unit 2 sends to DCE 4 a request for establishing communication (S32).

[0024]

When determining that line status is not good, communication control unit 2 sends to DCE 4 a request for monitoring the line status (S26). DCE 4 enters the monitoring mode for monitoring the line status. During the monitoring mode, DCE 4 checks the line status at predetermined intervals (S27).

Communication control unit 2, after sending the request, enters the standby mode (S28), and awaits a monitoring result from DCE 4 for a predetermined standby period. When the standby period expires, communication control unit 2 notifies application 6 of the interruption in communication (S29 → S31).

[0025]

DCE 4, when determining that the line status is good within the standby period, notifies communication control unit 2 of this line status, and communication control unit 2 sends to DCE 4 a request for establishing communication (S30 → S32). When determining that the line status is not good, DCE 4 continues monitoring the line status (S30 → S27).

[0026]

1.3. The principle of operation for establishing and reestablishing communication controlled by a port driver

Fig. 4 shows a communication system in which client C and server S as a data terminal equipment (DTE) are connected via DCEs 4C and 4S and communication line 5.

Client C comprises upper application 6C, physical port 7C, port driver 8C. Application 6C is, for example, the Point-to-Point Protocol (PPP) for establishing IP connections via a public network. Port driver 8C

recognizes and controls physical port 7C. Server S comprises application 6S, physical port 7S, and port driver 8S.

In this communication system, a port driver for recognizing a port to which DCE 4 is connected controls operations of an upper application on the basis of a line status. A port driver does not transfer to an upper application an interruption response code output from DCE 4 when communication is interrupted. As a result, the upper application continues a data transfer operation, when communication is reestablished automatically, a data transfer is resumed without a hitch.

[0027]

Fig. 5 shows communication establishing/reestablishing sequences in the communication system shown in Fig. 4.

Communication is established as follows.

(1) Port driver 8C, on receiving a connection request from application 6C (S40), inquires of DCE 4C about the line status (S41). (2) Port driver 8C, when determining on the basis of the response from DCE 4C that the line status is good (S42), sends a connection request to DCE 4C (S43), and records a number of server S (S44). This number is, for example, a telephone number if communication line 5 is a telephone line. However, the number is not limited to a telephone number, may be a user name, an IP address, etc. (3) Port driver 8S, on receiving the Ring signal, records a number of Client C (S45). DCEs 4C and 4S perform a negotiation to establish communication (S46).

[0028]

When the communication is interrupted, communication is reestablished as follows.

(1) Port drivers 8C and 8S, on receiving an interruption response code from DCE 4C or 4S (S48, S49), read the code (S50, S51). (2) When determining on the basis of the interruption response code that the

interruption cause is a temporary one, port drivers 8C and 8S do not notify applications 6C and 6S of the interruption in communication. (3) In client C, port driver 8C inquires of DCE 4C of the line status (S52). In server S, port driver 8S enters a standby mode (S53). (4) As a result of the line status inquiry, port driver 8C, when receiving a response telling that the line status is good, sends a connection request to server S (S55). (5) Port driver 8S, on receiving the connection request, checks a number of client C (S56), and performs an off-hook operation to establish communication (S57 → S58).

When determining on the basis of the interruption response code that the interruption cause is not a temporary one, port drivers 8C and 8S notify applications 6C and 6S of the interruption in communication, and terminate the communication.

The above is the principle of operation of the embodiment. Below are more concrete embodiments which comfort to the principle.

[0029]

2. The first embodiment (a continuation of operations of an application after an interruption in communication during a data downloading)

2.1. The configuration of the first embodiment

Fig. 6 shows a configuration of a communication system in which client C and server S are connected via communication line 5.

Client C comprises port driver 8C, communication port 7C, PPP 63C, Transmission Control Protocol (TCP) 62C which is a connection-oriented transport layer protocol, and communication application 61C. Port driver 8C recognizes and controls communication port 7C. Communication port 7C may be a serial port, a parallel port, a Universal Serial Bus (USB), etc. Server S comprises port driver 8S, communication port 7S, PPP 63S, TCP 62S, and communication application 61S.

[0030]

A connection is established by using a three-way handshake procedure as described below.

Step 1: A sending side sends to a receiving side a synchronous segment where the SYN bit is on.

Step 2: The receiving side, on receiving the synchronous segment, set the ACK bit to the on state and returns it to the sending side.

Step 3: The sending side, on receiving the segment, sends to the receiving side a segment where the ACK bit is on. Consequently, the sending and receiving sides understand that a connection has been established.

In a case of closing a connection, a sending side sends to a receiving side a transfer termination segment where the FIN bit is on at the end of data transfer, and the receiving side sends to a segment where the ACK bit is on.

[0031]

Port drivers 8C and 8S, when detecting an interruption in communication, try to reestablish communication without notifying communication ports 7C and 7S of the interruption in communication. Accordingly, even if communication is interrupted, application sides perform their operations without a hitch.

[0032]

2.2. Operations of the first embodiment

Operations of the first embodiment will be described with reference to Fig. 7.

Fig. 7(a) shows that client C is downloading files stored in a storage device of server S. As shown in Fig. 7(a), when the files are downloaded, they are transferred from server S to client C via DCE 4C by port driver 8C, PPP 63C, and TCP 62C. The downloaded files are stored in a storage unit of client C.

[0033]

Fig. 7(b) shows that communication between client C and server S is interrupted. In the prior art, when communication is interrupted, messages telling the interruption in communication are sent to PPPs 63C and 63S, and a session between client C and server S is closed.

In contrast, in this embodiment, port drivers 8C and 8S do not send interruption notifications from DCEs 4C and 4S, to PPPs 63C and 63S, TCPs 62C and 62S, and upper communication applications. Consequently, while communication is interrupted, TCP 62S repeats a sending operation toward the communication port. However, because communication has been interrupted, an acknowledgement (ACK) is not sent back to TCP 62S. As a result, TCP 62S repeats the sending operation.

TCP 62C repeats a receiving operation. Since port drivers 8C and 8S do not notify PPPs 63C and 63S, TCPs 62C and 62S, and communication applications, of the interruption in communication, the session between client C and server S is not closed.

[0034]

Fig. 7(c) shows that port drivers 8C and 8S reestablish communication after an interruption in communication between client C and server S. As shown in Fig. 7(c), communication is reestablished only by port drivers 8C and 8S. When client C sends a connection request to server S, port driver 8S of server S authenticates the connection request by a sender ID. DCEs 4C and 4S perform a negotiation to establish communication, and the transfer of files are resumed.

[0035]

Fig. 7(d) shows that interrupted communication between client C and server S has been reestablished. When a connection is established, server S resumes transferring files to client C from a point where the interruption in communication occurred, and an authentication process is

not required.

[0036]

2.3. Effects of the first embodiment

In the communication control method of the first embodiment, authentications for reestablishing communication are unnecessary, and even if communication is interrupted, data which has been downloaded by the time of the interruption is effectively utilized. Thus, this embodiment has advantages of reducing a communication time and a communication charge.

Also, this communication control method, where operations of applications are kept before and after an interruption in communication, is utilized for a variety of data communications such as a multimedia communication including a video distribution.

[0037]

3. The second embodiment (a continuation of operations of an application after an interruption in communication between facsimiles)

The present embodiment provides a communication control method for continuing communication between facsimiles.

In the communication control method, by providing communication control units 15A and 15B of facsimiles 10A and 10B with a function for reestablishing communication without notifying upper hardware and software of an interruption in communication, if communication is interrupted, the upper hardware and software continues their operations, and communication is reestablished automatically.

[0038]

3.1. The configuration of the second embodiment

Fig. 8 shows a configuration of a communication system where facsimiles communicate with each other.

Sending facsimile 10A comprises image outputting unit 11A, image

reading unit 12A, central control unit 13A, FAX protocol control unit 14A, and communication control unit 15A. Image outputting unit 11A prints out received image data on a paper. Image reading unit 12A reads an image printed on a paper to be transmitted via a CCD sensor, and outputs image data to a RAM. Central control unit 13A includes a CPU, a RAM and a ROM, and control the whole of the sending facsimile 10A. FAX protocol control unit 14A controls an image transfer protocol in facsimile 10A. Communication control unit 15A controls establishment of communication with another device.

Receiving facsimile 10B comprises image outputting unit 11B, image reading unit 12B, central control unit 13B, FAX protocol control unit 14B, and communication control unit 15B.

[0039]

3.2. The operations of the second embodiment

Operations of the second embodiment will be described with reference to Fig. 8.

Sending Facsimile 10A establishes a connection with receiving facsimile 10B, and the sender ID of sending facsimile 10A is recorded in receiving facsimile 10B. When communication is interrupted during a data transfer by facsimile, an interruption code "NO_CARRIER" is sent to communication control units 15A and 15B. Communication control unit 15A of sending facsimile 10A enters a standby mode. On the other hand, communication control unit 15A of receiving facsimile 10B sends a connection request. Communication control unit 15B, when receiving the connection request, authenticates the sender ID of sending facsimile 10A, and data transfer by facsimile is resumed not from its beginning but from a point where the interruption occurred.

[0040]

Fig. 9 is a diagram for explaining a situation where communication

is interrupted during a data transfer by facsimile between a sending facsimile and a receiving facsimile. Fig. 9(a) shows a situation where communication between them is not yet interrupted. Fig. 9(b) shows a situation as of an interruption in communication between them. Fig. 9(c) shows a situation where communication between them is already interrupted. As shown in Fig. 9, since a status before an interruption in communication is maintained, if communication is interrupted during a data transfer of a paper on which a character "A" is printed, communication is reestablished automatically, a receiving facsimile outputs an image from a point where the interruption occurred.

[0041]

3.3. Effects of the second embodiment

As stated above, in the communication control method of the present embodiment, if communication is interrupted, a user of a facsimile can start a data transfer from a point of the interruption in communication, instead of starting the data transfer from scratch. As a result, it becomes possible to save a user for starting a data transfer from scratch, and to reduce a communication charge caused by the retransmission.

[0042]

4. The third embodiment (operations of establishing communication in data communication using a mobile phone)

In the present embodiment, a mobile phone is connected to a computer via a communication adapter, and when an AT command is sent to the communication adapter, information returned to the mobile phone in response to a call from the mobile phone is provided to the communication adapter. On the basis of the provided information, a variety of information on communication such as a line status or a cause for an interruption is obtained and utilized when establishing communication.

[0043]

4.1. The configuration of the third embodiment

Fig. 10 shows a communication system where notebook computer 30 communicates data with computer 40 via mobile phone 33. The system shows a mobile computing environment where a user performs data communications at any place using notebook computer 30 and mobile phone 33.

For example, using notebook computer 30, a user can exchange electronic mails, use an on-line service, or access homepages on the Internet.

[0044]

Communication adapter (PC card) 31 is connected to notebook computer 30, and converts to radio signals a variety of data sent from notebook computer 30. Communication adapter 31 is connected also to mobile phone 33 via connecting cable 32.

Notebook computer 30 sends a connection request to computer 40 via communication adapter 31. When the connection request is not received by computer 40, communication adapter 31 sends to notebook computer 30 a busy signal "BUSY" indicating that computer 40 is on another line or a no carrier signal "NO_CARRIER" indicating that a carrier is not detected.

[0045]

Mobile phone 33, when receiving a connection request from notebook computer 30, transfer the connection request to radio base station 34 covering the current location of mobile phone 33. The connection request is further transferred to telephone network 39 via mobile communication control stations 35 and 37, and gateway station 38, and communication between notebook computer 30 and computer 40 is established.

Location information of mobile phone 33 is timely stored in a

database of home memory station 36.

[0046]

4.2. The Operations of the third embodiment

In the communication control method using a mobile phone, operations of establishing communication in view of a line status will be described with reference to Fig. 11.

When an interruption response code is sent to a communication control unit of notebook computer 30 via communication adapter 31, the communication control unit analyzes the interruption response code (S60) to determined whether the code is a code telling that reestablishment of communication is possible (S61).

The interruption response code is a code telling a cause of an interruption such as that a telephone number of a destination is unused one or that a destination phone is out of the radius of communication.

When the interruption response code is a code telling that reestablishment of communication is impossible, the communication control unit does not execute operations for automatically reestablishing communication (S61 → S69). When the interruption response code is a code telling that reestablishment of communication is possible, the communication control unit executes operations described below (S61-68).

[0047]

The communication control unit, when receiving an AT command telling a line status of mobile phone 33, analyzes the AT command. When the AT command tells that mobile phone 33 is within the area covered by radio base station 34, the communication control unit sends a connection request (S64 → S67).

When the AT command tells that mobile phone 33 is out of the area covered by radio base station 34, the communication control unit timely obtains a response code (S64 → S65), analyzes the response code, and

remains on standby until obtaining a response code telling that mobile phone has entered in the area covered by radio base station 34 (S66 → S68 → S65). The communication control unit, when obtaining a response code telling that mobile phone has entered in the area covered by radio base station 34, sends a connection request (S66 → S67). When a standby period expires, the communication control unit ends operations for reestablishing communication (S68 → S69).

In this embodiment, instead of the AT command, other kinds of commands may be used.

[0048]

4.3. Effects of the third embodiment

The communication control method of the present embodiment, by considering a line status and causes for an interruption, enables efficient establishment or reestablishment of communication.

[0049]

5. Modifications

The present invention can be implemented as described below.

(1) The function of the port driver of the first embodiment may be provided in a DCE or a PPP.

(2) In the above embodiments, a modem is used as data circuit-terminating equipment. A data service unit (DSU) may be used for connecting two computers via a dedicated line.

(3) The present invention can be applied to communications through a public telephone network, a dedicated line, a CATV network, or a LAN, satellite communication, radio communication, or infrared communication.

(4) The PPP and the TCP of the client of the first embodiment may be another protocol such as XMODEM, YMODEM, B_Plus, Kermit, Quick-VAN.

(5) The mobile phone of the third embodiment may be a variety of

communication terminals such as a PHS phone or a personal digital assistant.

(6) The communication control methods of the above embodiments may be realized by storing a program for causing a computer to execute the communication control methods in a storage medium such as a CD-ROM or a floppy disk, and by installing the program on a communication terminal. Also, the communication control methods may be realized by attaching to a communication terminal a discrete device for executing the communication control methods.

[0050]

[Effects of the Invention]

As stated above, according to the present invention, if communication is interrupted during a data transfer, communication is reestablished automatically, and the data transfer is resumed where the interruption in communication occurred. Also, a communication terminal establishes communication in view of information on a line status, the communication terminal can avoid a failure of establishing communication due to a line fault.

[Brief Description of the Drawings]

[Fig. 1] a block diagram showing a configuration of a communication system where a communication control method according to the embodiment is implemented.

[Fig. 2] a flowchart showing the principle of operation of establishing communication.

[Fig. 3] a flowchart showing the principle of operation of reestablishing communication after an interruption in communication.

[Fig. 4] a block diagram showing a configuration of a communication system where a communication control method according to the embodiment is implemented, and where a port driver performs

communication controls.

[Fig. 5] a flowchart showing operations of establishing and reestablishing communication in the embodiment.

[Fig. 6] a block diagram showing a configuration of a communication system where a communication control method according to the first embodiment is implemented.

[Fig. 7] (a) a diagram showing that client C is downloading files stored in a hard disk of server S; (b) a diagram showing that communication between them is interrupted; (c) a diagram showing that port drivers 8C and 8S reestablish communication after an interruption in communication between client C and server S; and (d) showing that interrupted communication between client C and server S has been reestablished.

[Fig. 8] a block diagram showing a configuration of a communication system where a communication control method according to the second embodiment is implemented.

[Fig. 9] a diagram for explaining a situation where communication is interrupted during a data transfer by facsimile between a sending facsimile and a receiving facsimile; (a) a diagram explaining a situation where communication between them is already interrupted; (b) a diagram explaining a situation as of an interruption in communication between them; and (c) a diagram explaining a situation where communication between them is already interrupted.

[Fig. 10] a block diagram showing a configuration of a communication system where a communication control method according to the third embodiment is implemented.

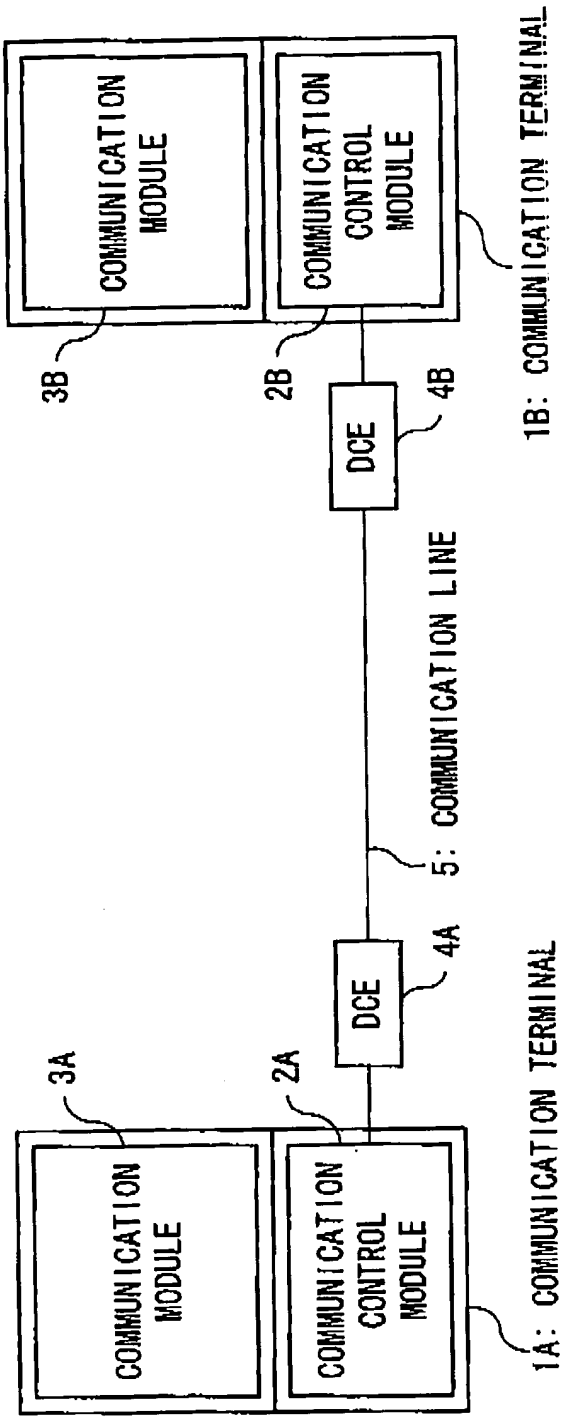
[Fig. 11] a flowchart showing operations of establishing communication in view of a line status in the third embodiment.

[Explanation of Reference Numerals in the Drawings]

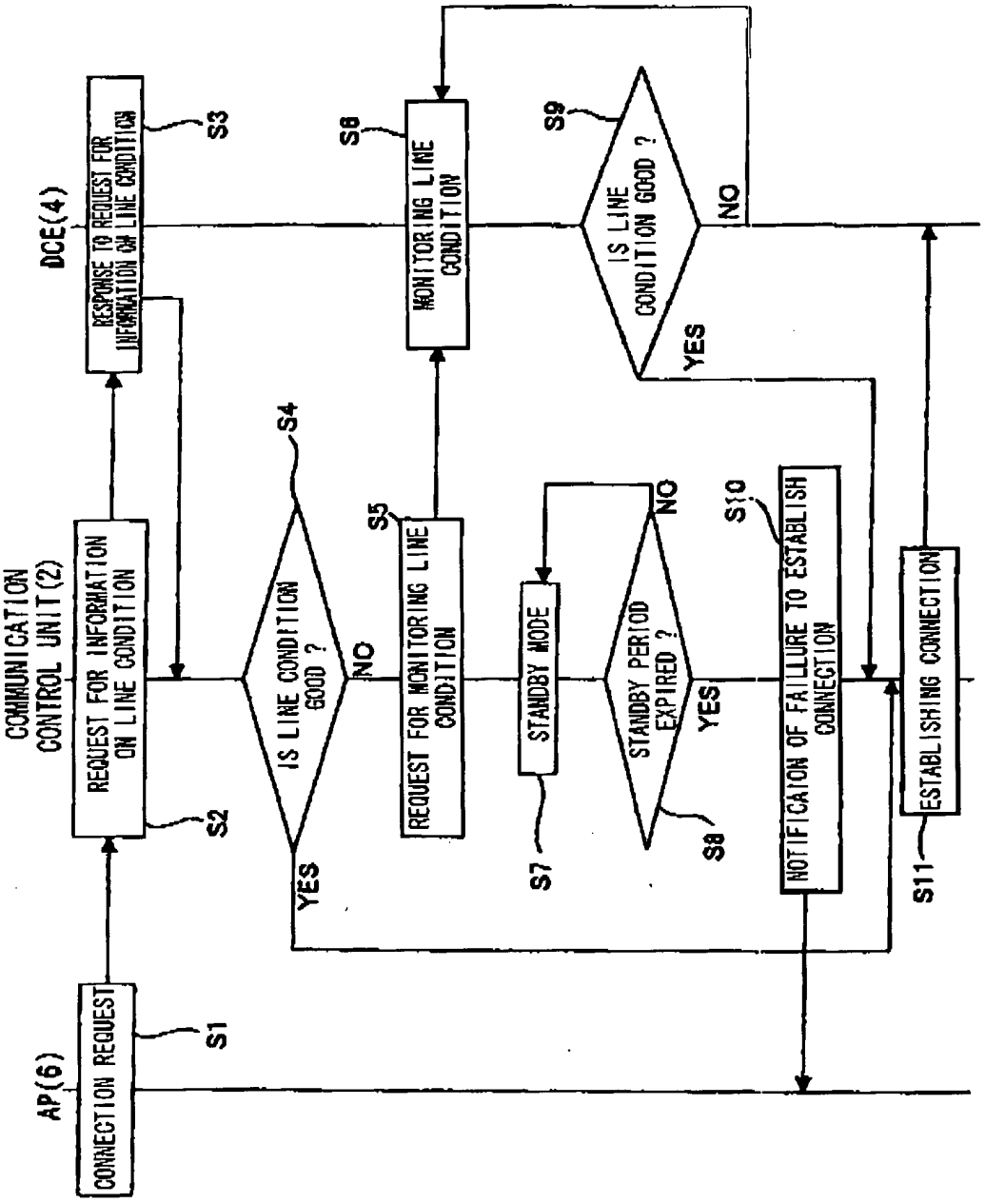
1 (1A, 1B)	Communication terminal
2 (2A, 2B)	Communication control module
3 (3A, 3B)	Communication module
4 (4A, 4B)	DCE
5	Communication line
6 (6A, 6B)	Application
7	Communication port
8 (8C, 8S)	Port driver
10 (10A, 10B)	Facsimile
11 (11A, 11B)	Image outputting unit
12 (12A, 12B)	Image reading unit
13 (13A, 13B)	Central control unit
14 (14A, 14B)	FAX protocol control unit
15 (15A, 15B)	Communication control unit (NCU)
30	Notebook computer
31	Communication adapter
33	Mobile phone
34	Radio base station
35, 37	Mobile communication control station
36	Home memory station
38	Gateway station
39	Telephone network
61 (61C, 61S)	Communication application
62 (62C, 62S)	TCP
63 (63C, 63S)	PPP
C	Client
S	Server

【DOCUMENT NAME】 DRAWINGS

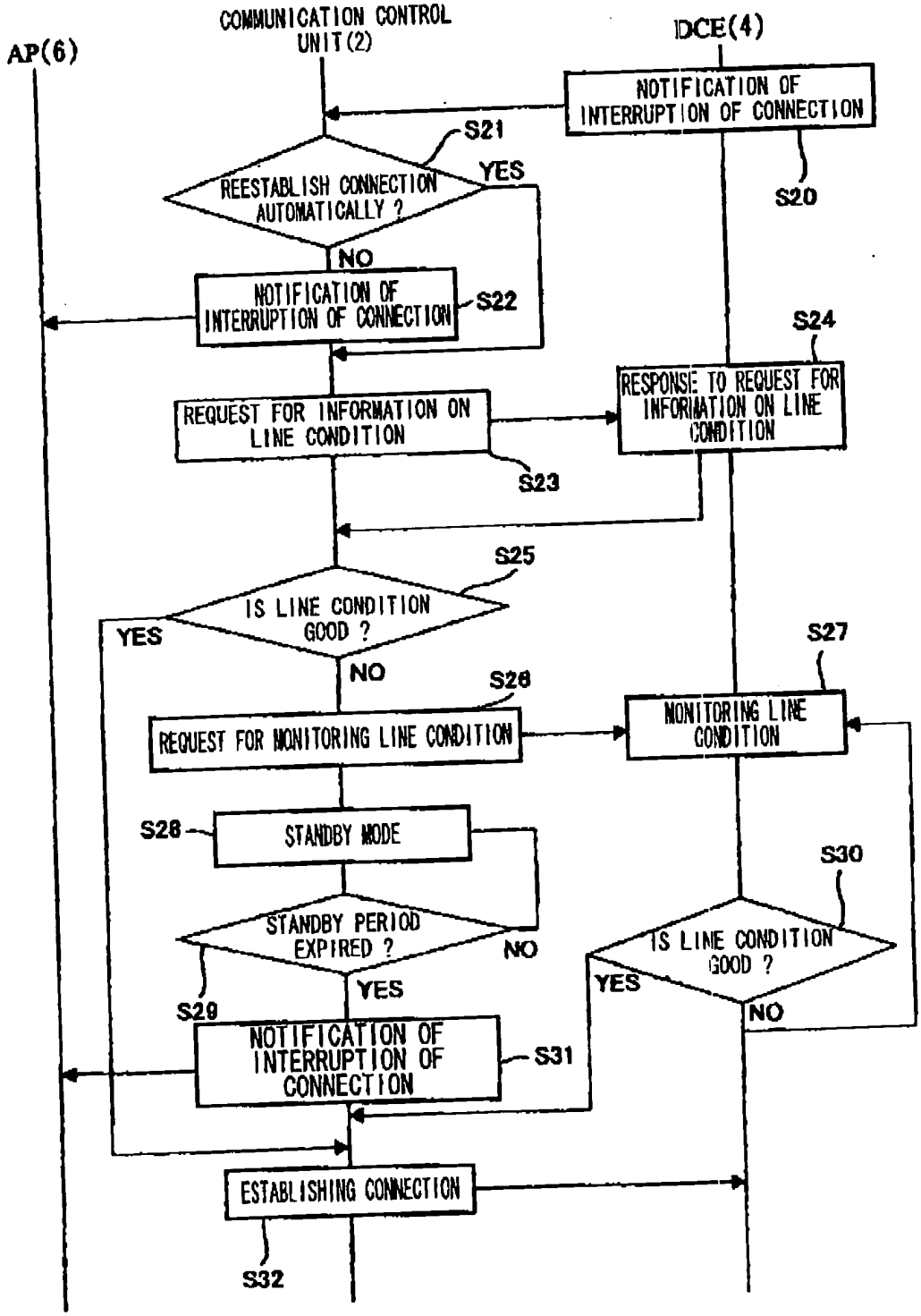
【FIG. 1】



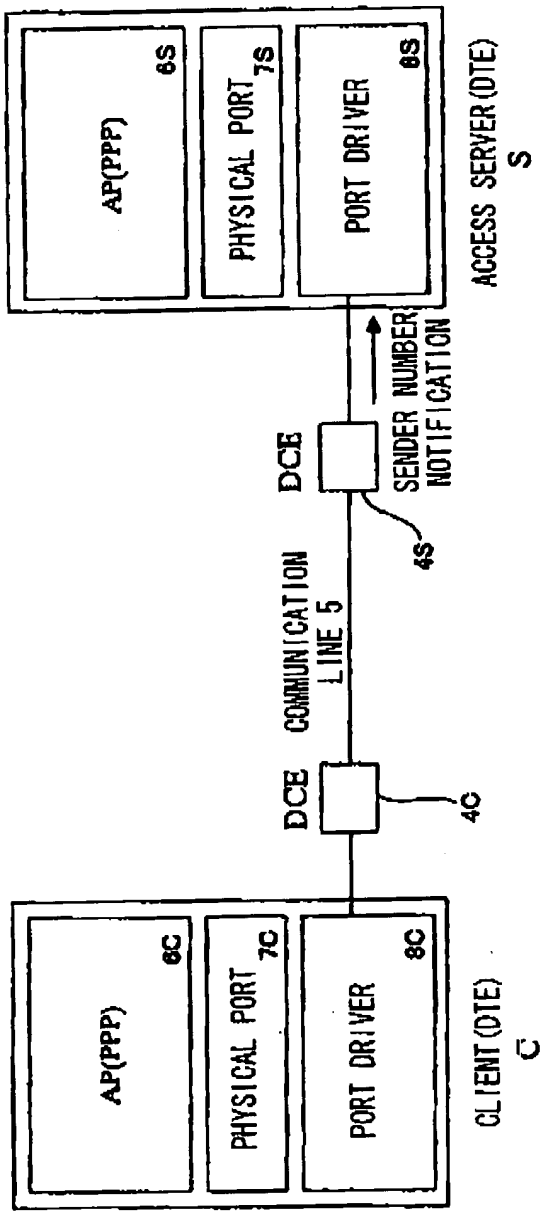
[FIG. 2]


AP(6)
DCE(4)
COMMUNICATION CONTROL UNIT(2)
CONNECTION REQUEST
S1
REQUEST FOR INFORMATION ON LINE CONDITION
S2
RESPONSE TO REQUEST FOR INFORMATION ON LINE CONDITION
S3
IS LINE CONDITION GOOD ?
S4
YES
NO
REQUEST FOR MONITORING LINE CONDITION
S5
MONITORING LINE CONDITION
S8
IS LINE CONDITION GOOD ?
S9
NO
YES
STANDBY MODE
S7
STANDBY PERIOD EXPIRED ?
S8
NO
YES
NOTIFICATION OF FAILURE TO ESTABLISH CONNECTION
S10
ESTABLISHING CONNECTION
S11

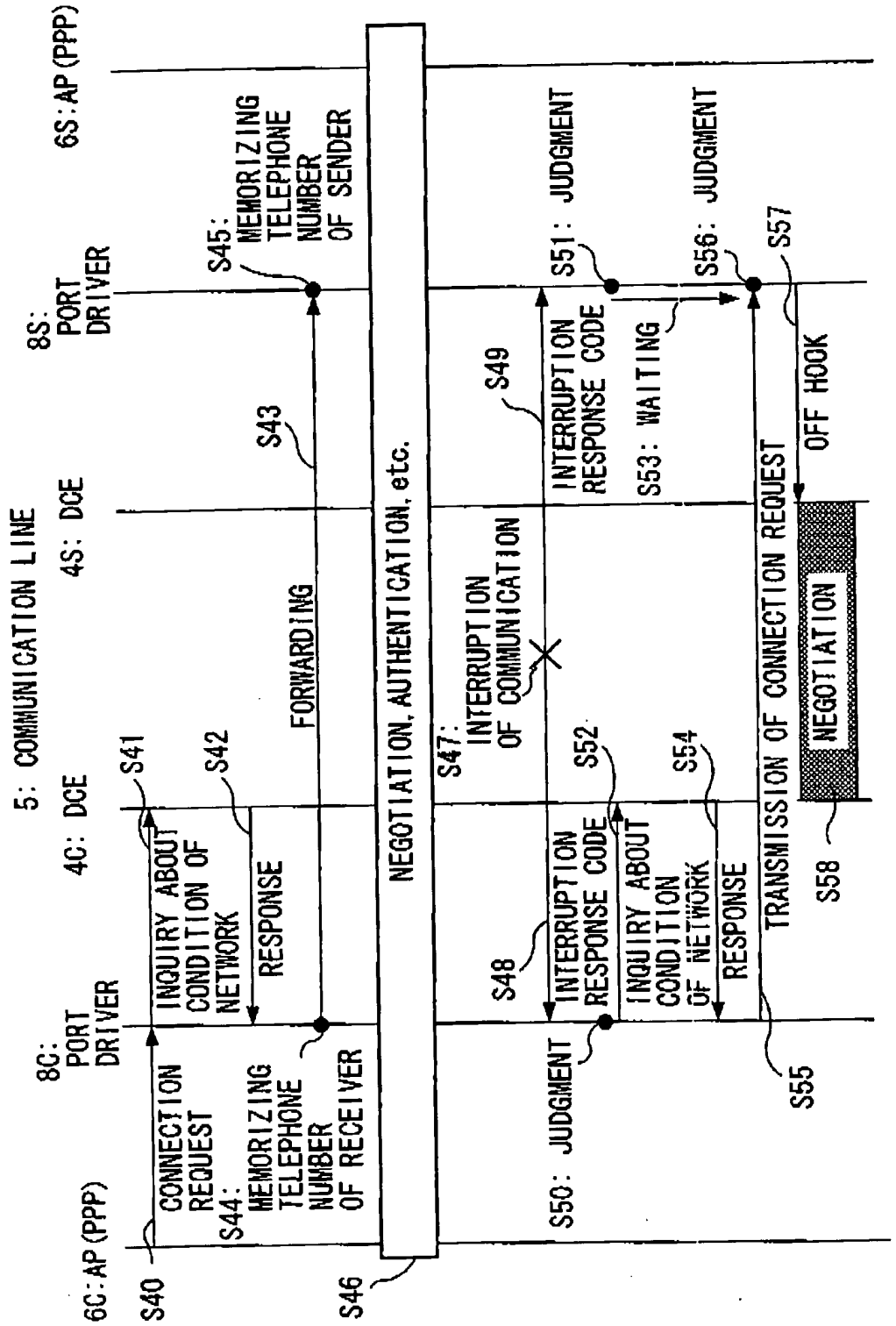
[FIG. 3]


AP(6)
COMMUNICATION CONTROL UNIT(2)
DCE(4)
NOTIFICATION OF INTERRUPTION OF CONNECTION
S20
S21
REESTABLISH CONNECTION AUTOMATICALLY ?
YES
NO
NOTIFICATION OF INTERRUPTION OF CONNECTION
S22
S24
REQUEST FOR INFORMATION ON LINE CONDITION
S23
RESPONSE TO REQUEST FOR INFORMATION ON LINE CONDITION
S25
IS LINE CONDITION GOOD ?
YES
NO
S26
REQUEST FOR MONITORING LINE CONDITION
S27
MONITORING LINE CONDITION
S28
STANDBY MODE
STANDBY PERIOD EXPIRED ?
NO
YES
S29
S30
IS LINE CONDITION GOOD ?
YES
NO
NOTIFICATION OF INTERRUPTION OF CONNECTION
S31
ESTABLISHING CONNECTION
S32

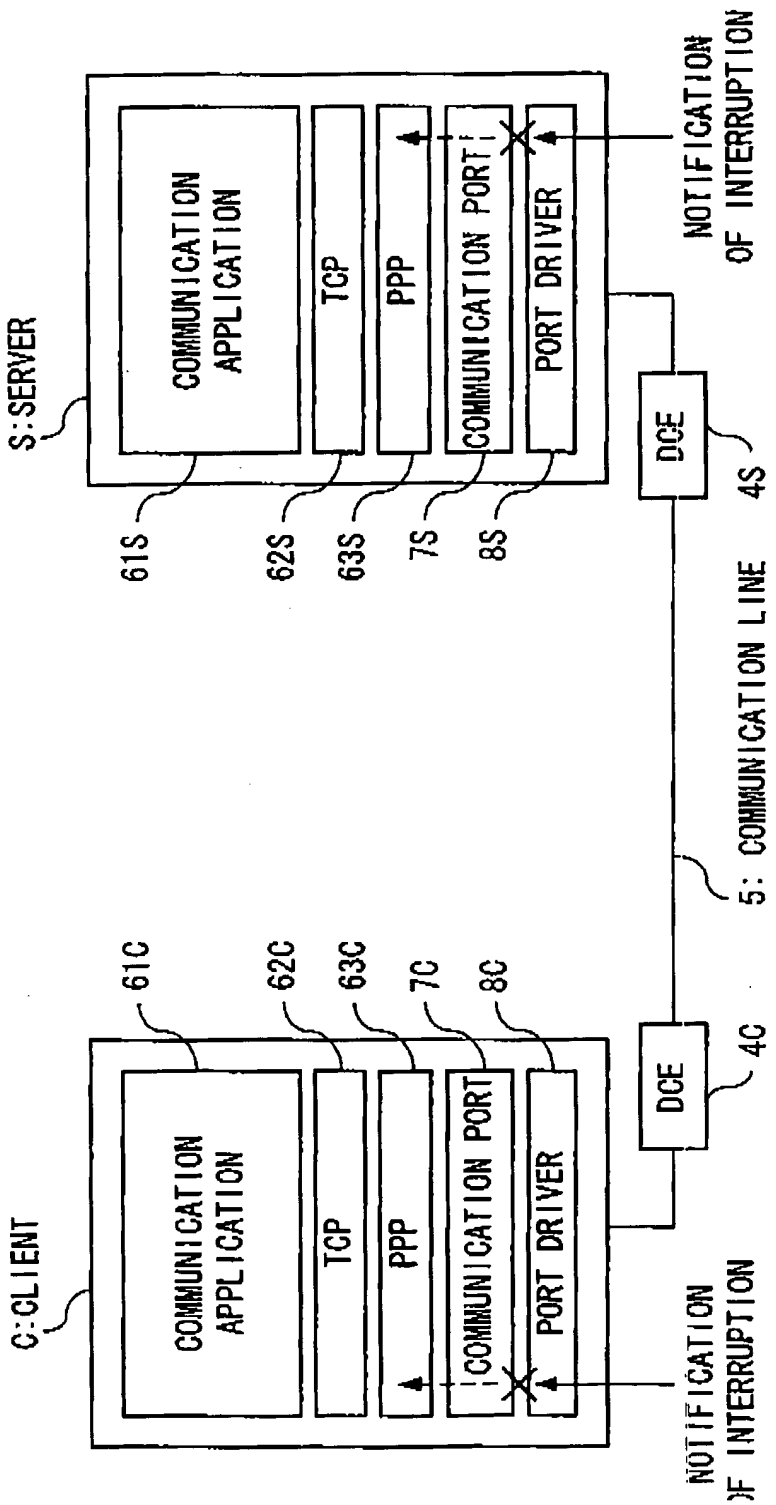
【FIG. 4】


AP(PPP)
6S
PHYSICAL PORT
7S
PORT DRIVER
8S
ACCESS SERVER(DTE)
S
SENDER NUMBER NOTIFICATION
DCE
4S
COMMUNICATION LINE 5
DCE
4C
AP(PPP)
6C
PHYSICAL PORT
7C
PORT DRIVER
8C
CLIENT(DTE)
C

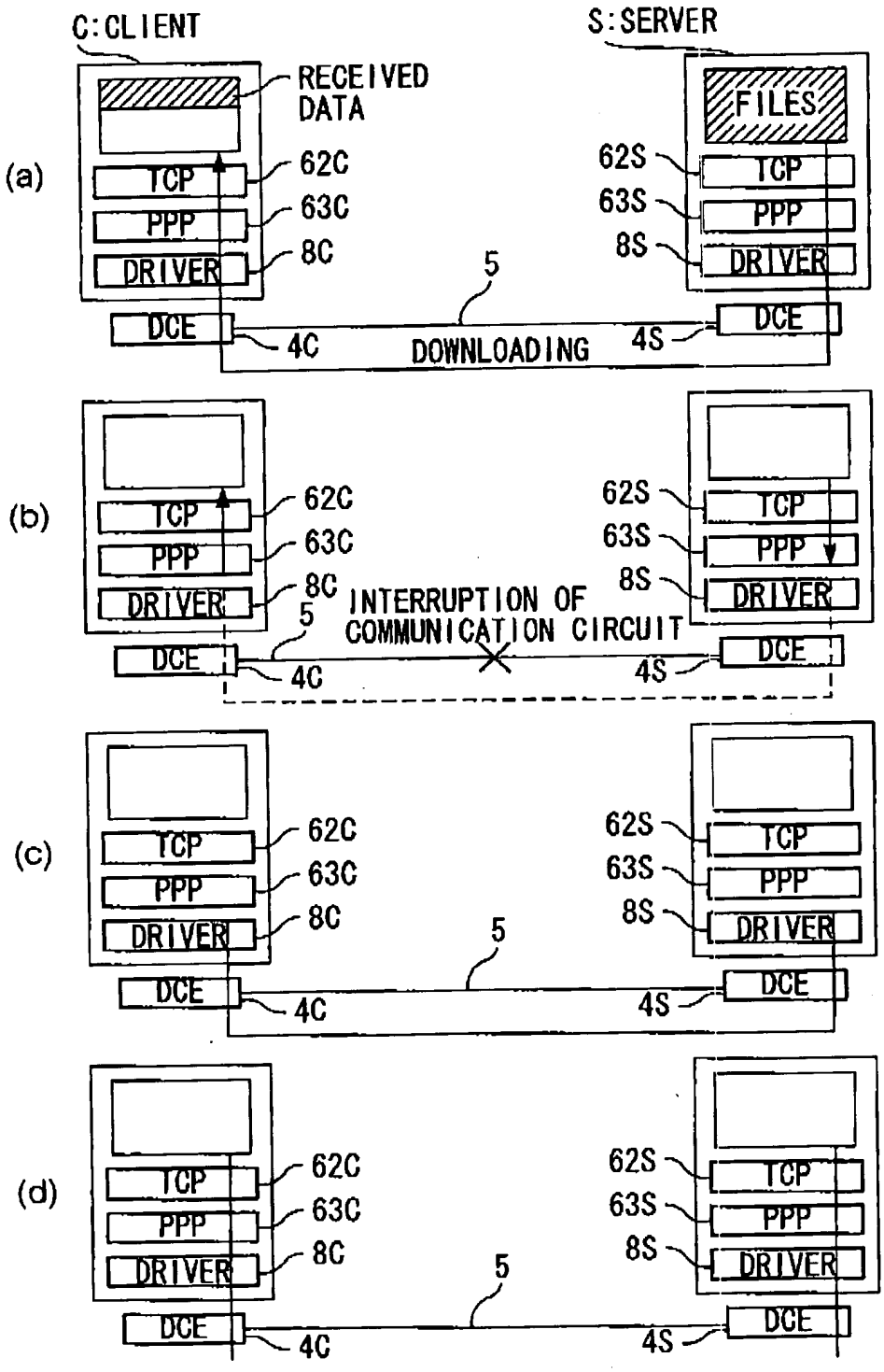
【FIG. 5】


6C: AP (PPP)
8C: PORT DRIVER
4C: DCE
5: COMMUNICATION LINE
4S: DCE
8S: PORT DRIVER
6S: AP (PPP)
S40
CONNECTION REQUEST
S41
INQUIRY ABOUT CONDITION OF NETWORK
S42
RESPONSE
S44: MEMORIZING TELEPHONE NUMBER OF RECEIVER
S43
FORWARDING
S45: MEMORIZING TELEPHONE NUMBER OF SENDER
S46
NEGOTIATION, AUTHENTICATION, etc.
S47: INTERRUPTION OF COMMUNICATION
S48
INTERRUPTION RESPONSE CODE
S49
INTERRUPTION RESPONSE CODE
S50: JUDGMENT
S51: JUDGMENT
S52
INQUIRY ABOUT CONDITION OF NETWORK
S53: WAITING
S54
RESPONSE
S55
S56: JUDGMENT
S57
OFF HOOK
TRANSMISSION OF CONNECTION REQUEST
NEGOTIATION
S58

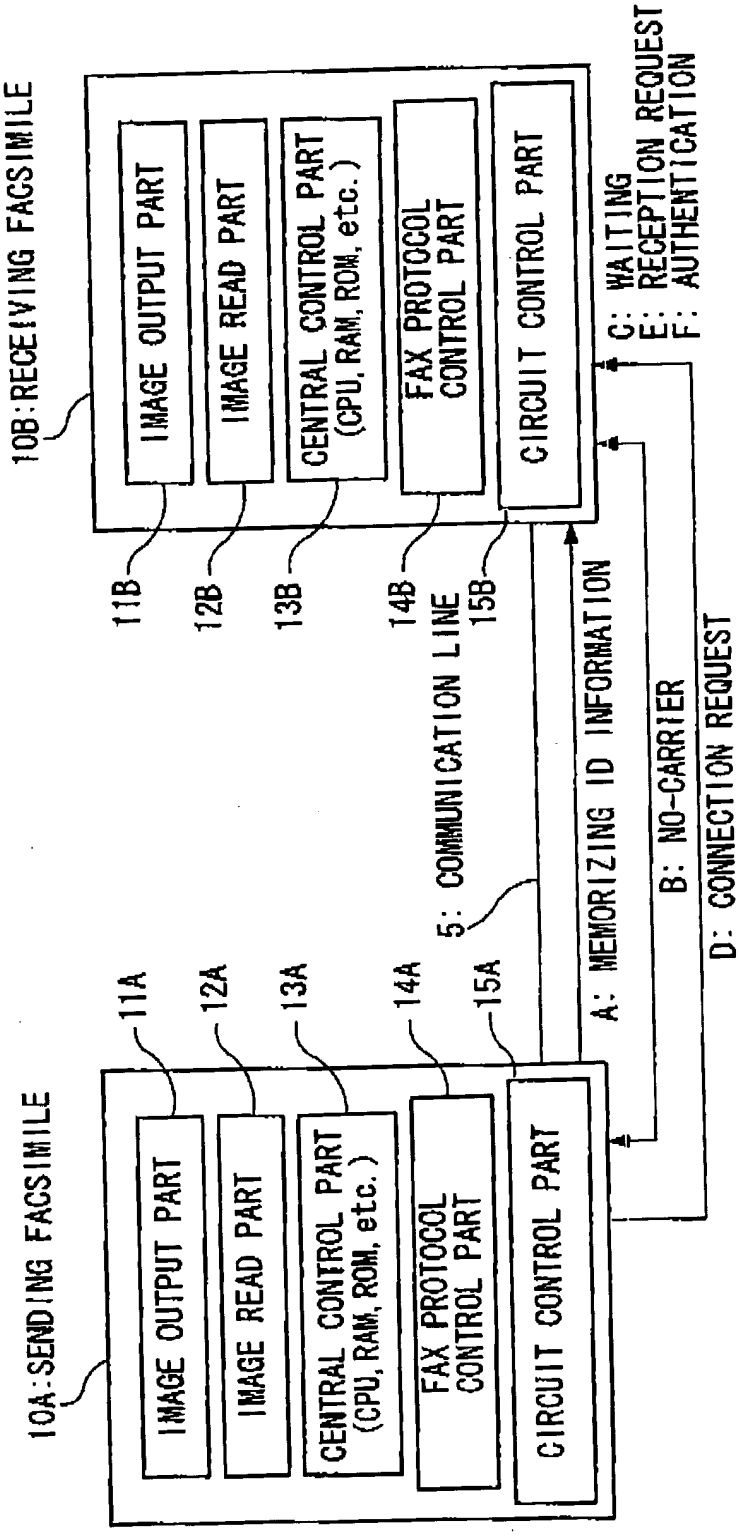
【FIG. 6】


S:SERVER
COMMUNICATION APPLICATION
TCP
PPP
COMMUNICATION PORT
PORT DRIVER
NOTIFICATION OF INTERRUPTION
DCE
4S
61S
62S
63S
7S
8S
5: COMMUNICATION LINE
61C
62C
63C
7C
8C
C:CLIENT
COMMUNICATION APPLICATION
TCP
PPP
COMMUNICATION PORT
PORT DRIVER
DCE
4C
NOTIFICATION OF INTERRUPTION

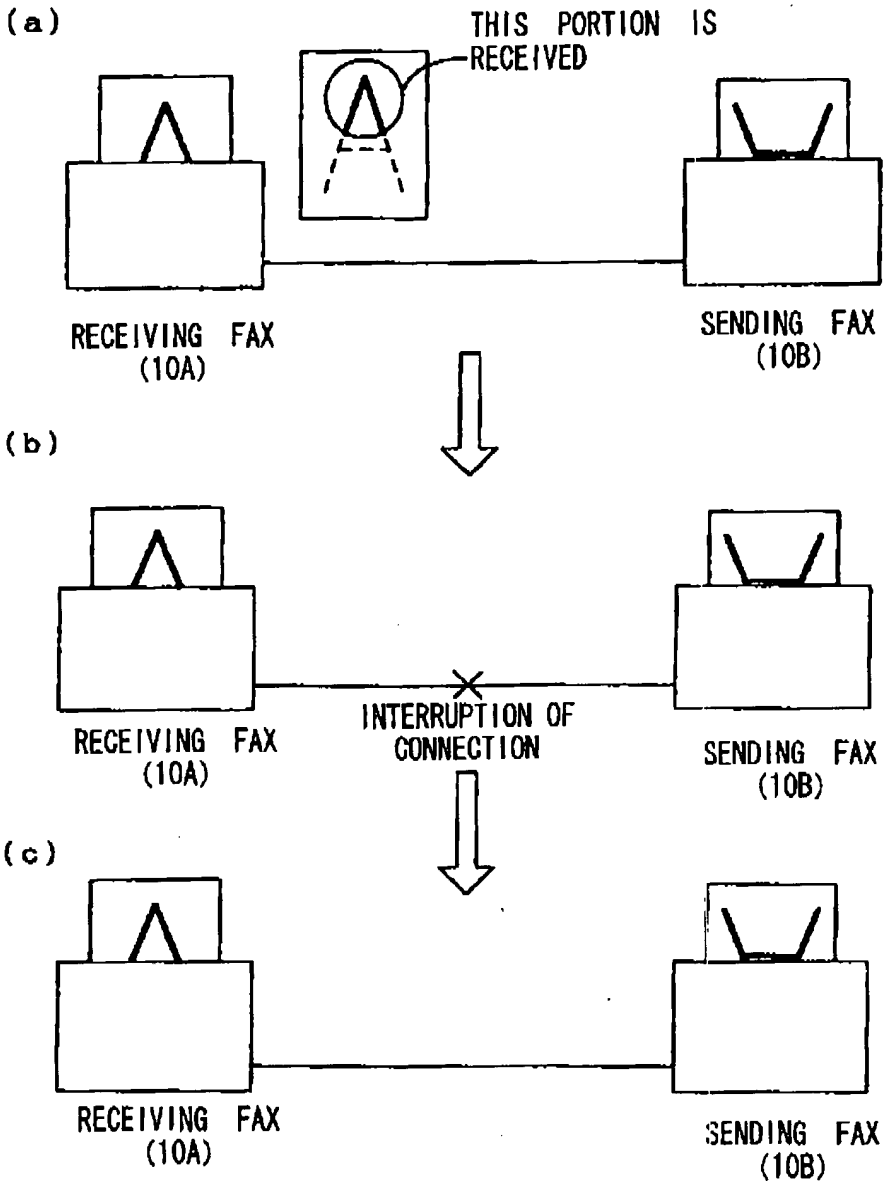
[FIG. 7]


C:CLIENT
S:SERVER
RECEIVED DATA
FILES
(a)
TCP
PPP
DRIVER
62C
63C
8C
62S
63S
8S
5
DCE
4C
DOWNLOADING
4S
(b)
INTERRUPTION OF COMMUNICATION CIRCUIT
(c)
(d)

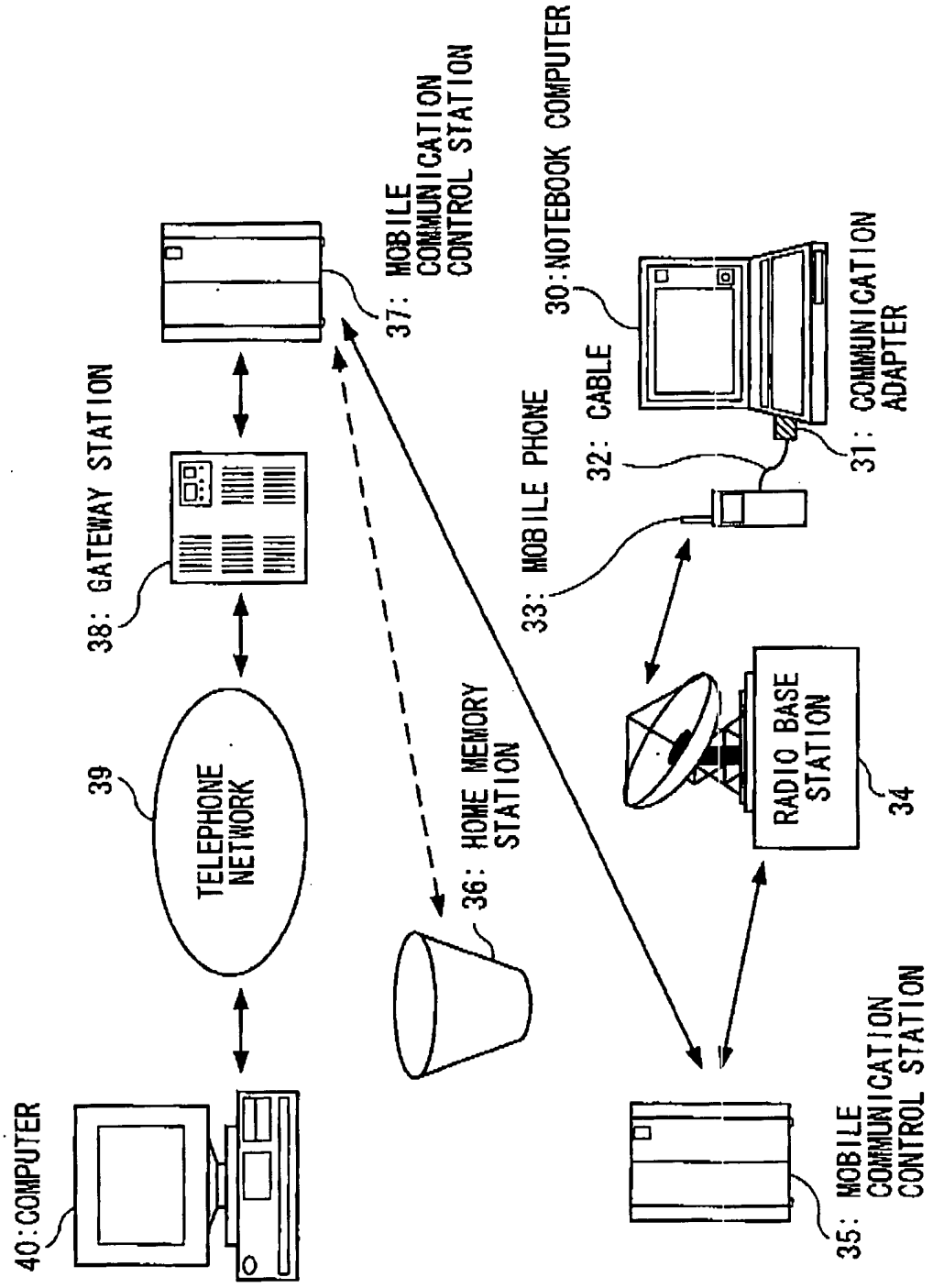
【FIG. 8】


10B: RECEIVING FACSIMILE
IMAGE OUTPUT PART
IMAGE READ PART
CENTRAL CONTROL PART (CPU, RAM, ROM, etc.)
FAX PROTOCOL CONTROL PART
CIRCUIT CONTROL PART
11B
12B
13B
14B
15B
C: WAITING
E: RECEPTION REQUEST
F: AUTHENTICATION
5: COMMUNICATION LINE
A: MEMORIZING ID INFORMATION
B: NO-CARRIER
D: CONNECTION REQUEST
10A: SENDING FACSIMILE
11A
12A
13A
14A
15A
IMAGE OUTPUT PART
IMAGE READ PART
CENTRAL CONTROL PART (CPU, RAM, ROM, etc.)
FAX PROTOCOL CONTROL PART
CIRCUIT CONTROL PART

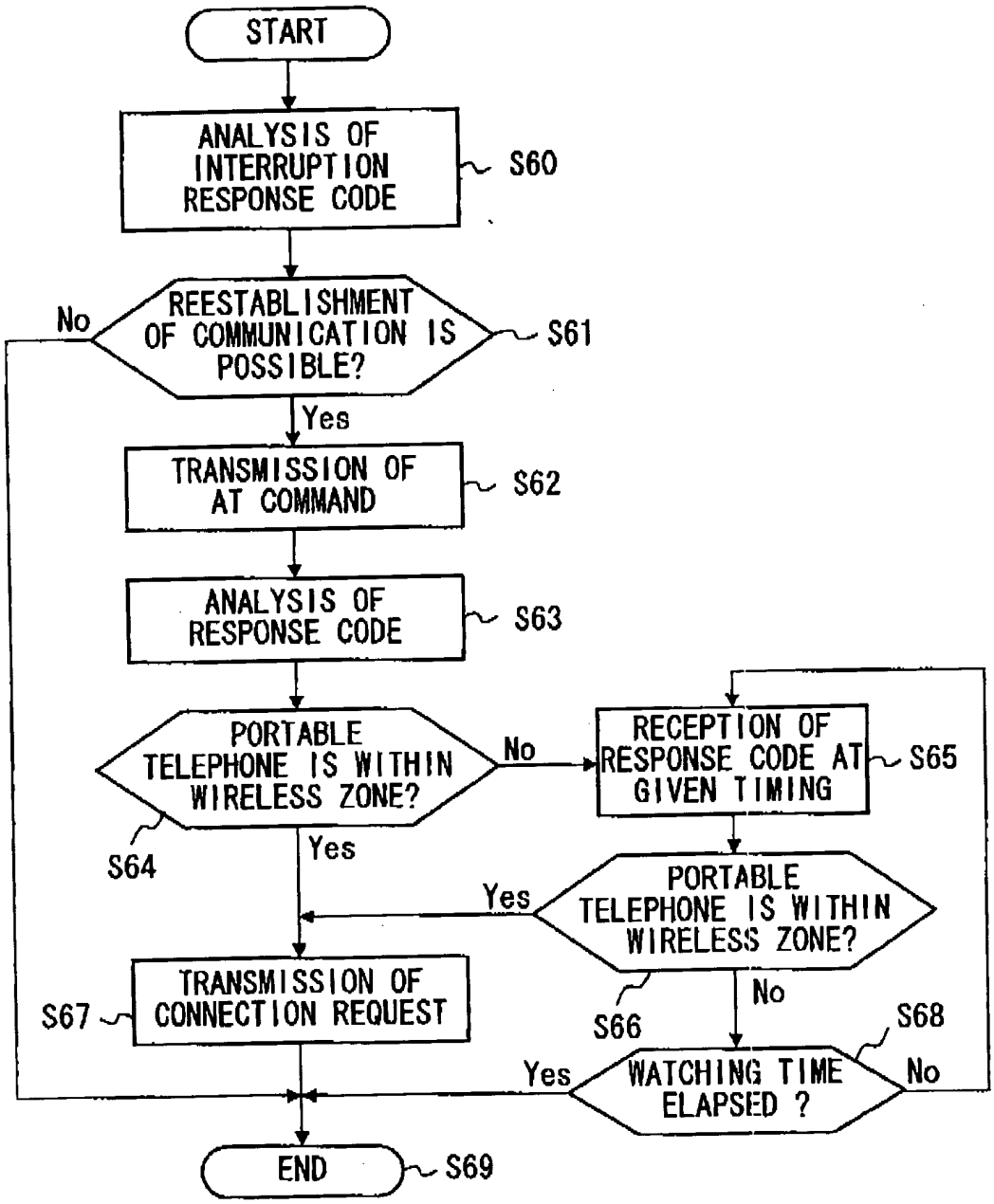
[FIG. 9]


(a)
THIS PORTION IS RECEIVED
RECEIVING FAX (10A)
SENDING FAX (10B)
(b)
RECEIVING FAX (10A)
INTERRUPTION OF CONNECTION
SENDING FAX (10B)
(c)
RECEIVING FAX (10A)
SENDING FAX (10B)

【FIG. 10】


37: MOBILE COMMUNICATION CONTROL STATION
30: NOTEBOOK COMPUTER
31: COMMUNICATION ADAPTER
32: CABLE
33: MOBILE PHONE
38: GATEWAY STATION
39
TELEPHONE NETWORK
36: HOME MEMORY STATION
RADIO BASE STATION
34
40: COMPUTER
35: MOBILE COMMUNICATION CONTROL STATION

【FIG. 11】


START
ANALYSIS OF INTERRUPTION RESPONSE CODE
S60
REESTABLISHMENT OF COMMUNICATION IS POSSIBLE?
S61
No
Yes
TRANSMISSION OF AT COMMAND
S62
ANALYSIS OF RESPONSE CODE
S63
PORTABLE TELEPHONE IS WITHIN WIRELESS ZONE?
S64
No
Yes
RECEPTION OF RESPONSE CODE AT GIVEN TIMING
S65
PORTABLE TELEPHONE IS WITHIN WIRELESS ZONE?
S66
Yes
No
WATCHING TIME ELAPSED ?
S68
Yes
No
TRANSMISSION OF CONNECTION REQUEST
S67
END
S69

[Document Name] Abstract

[Abstract]

[Problem to be solved] To provide a communication control method, a communication control device, and a storage medium which make it possible to establish, or reestablish if communication is interrupted, communication smoothly.

[Solution] When communication terminal 1A is connected to communication terminal 1B via communication line 5, and is accessing communication terminal 1B, if communication between the terminals is interrupted, communication control module 2A does not notify communication module 3A of the interruption in communication, thereby causing communication module 3A to continue the data transfer operation. Communication control module 2A reestablishes communication using DCE 4A, and communication module 3A resumes the data transfer from a point where the interruption in communication occurred.

[Selected View] Fig. 1